

## THE GASTEROMYCETES OF AUSTRALASIA. XIII.

### THE GENUS *PISOLITHUS*.

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(Plate xvii.)

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As has been shown in the previous paper, the family Sclerodermaceae is limited to the genera *Scleroderma* and *Pisolithus*. The latter differs from the former in that the tramal plates, instead of breaking up and disappearing in mature plants, remain to form a honeycomb-like tissue. This is due to the persistence of the tramal plates, the hyphae of which are infiltrated and gelatinized to form a firm, carbonous, brittle tissue. The spore mass at maturity completely fills these cavities; and in developing plants is enclosed within a delicate hyphal layer, free from the carbonous tramal plates. Because of this, these spore masses have been termed peridiola, a term which has persisted since the days of Fries; but as they are not comparable with the peridiola of the Nidulariales, the term is a misnomer and should be discarded. In typical plants the peridium is supported upon a firm rooting base, and as this structure is also carbonous in mature plants, it frequently persists for long after the more fragile peridium has been dispersed. The genus is at home in warm sandy regions, and, although common in Australia, is confined to the thermal regions of the North Island of New Zealand.

#### *PISOLITHUS* Albertini and Schweinitz.

*Consp. fung. Lusatiae sup. Nisk. cresent.*, 1805, p. 82.—*Scleroderma* Pers., *Syn. Meth. Fung.*, 1801, p. 151, *pro parte*.—*Polysaccum* DC. et Desp., *Rapp. voy. bot. l'Ouest Fr.*, i, 1807, p. 8.—*Pisocarpium* Link, *Mag. Ges. nat. Freunde Berlin*, iii, 1809, p. 33.

Plant consisting of a peridium supported on a stem-like rooting base. Peridium of a single thin membranous layer, flaking away irregularly from the apex. Gleba divided into polygonal cells by the persistent tramal plates; cells filled with the spore mass, a true capillitium wanting. Spores coloured, globose, verrucose.

*Habitat*.—Growing half buried in the ground in sandy soils.

*Type species*, *Scleroderma tinctorium* (Mich.) Pers.

*Distribution*.—Europe; North America; East Indies; Africa; Australia; New Zealand.

The genus contains but two, or possibly three, valid species. Of these, *P. tinctorius* has a distribution similar to that of the genus; *P. microcarpus* is confined to Australia; and *P. Boudieri* (*Polysaccum Boudieri* Lloyd, *Myc. Notes*, 1904, p. 184) is confined to the Island of Corsica. Dehiscence proceeds from the apex downwards (as does maturation of the gleba) so that old specimens are

often represented by the persistent sterile base alone. The persistent tramal plates of the gleba are characteristic and during development of the plant enclose the hymenial layer, which consists of a delicate layer of hyphae lying next the tramal plate wall, and an irregular layer interior to this composed of basidia (pear-shaped or somewhat clavate) bearing 4-6, practically sessile spores. The development has not yet been studied, so that particulars are not available.

1. *PISOLITHUS TINCTORIUS* (Micheli ex Persoon) Coker and Couch.

*Gasteromyces* of *E. United States and Canada*, 1928, p. 170.—? *Scleroderma herculaneum* (Pall.) Pers., *Syn. Meth. Fung.*, 1801, p. 151.—*S. tinctorium* (Mich.) Pers., *l.c.*, p. 152.—*Pisolithus arenarius* Alb. et Schw., *Conspectus*, 1805, p. 82.—*Polysaccum crassipes* DC. et Desp., *Rapp. voy. bot. Fr.*, i, 1807, p. 8.—*P. acaule* DC., *Fl. Fr.*, v, 1815, p. 103.—*Pisocarpium clavatum* Nees, *Syst. u. Pilze*, 1816, p. 138.—? *Polysaccum herculeum* (Pers.) Fr., *Syst. Myc.*, iii, 1829, p. 52.—*P. turgidum* Fr., *l.c.*, p. 53.—*P. olivaceum* Fr., *l.c.*, p. 54.—*P. Pisocarpium* Fr., *l.c.*—*P. tuberosum* (Mich.) Fr., *l.c.*, p. 55.—*P. conglomeratum* Fr., *l.c.*—*P. arenarium* (Alb. et Schw.) Cda., *Icon. Fung.*, ii, 1838, p. 24.—*Polysaccum tinctorium* Mont., *Phyto. Canariensis*, 1840, p. 87.—*P. australe* Lev., *Ann. Sci. Nat.*, ser. 3, ix, 1848, p. 136.—*P. marmoratum* Berk., *Journ. Linn. Soc., Bot.*, xiii, 1872, p. 155.—*P. leptothecum* Reich., *Reise Oesterr. Freg. Novara um d. Erde*, i, 1870, p. 134.—*P. boreale* Karst., *Not. Faun. et Flor. Fenn.*, viii, 1882, p. 203.—*Pisolithus crassipes* (DC.) Schroet., *Krypt. Fl. Schles.*, iii, 1889, p. 706.—*Scleroderma umbrina* Cke. et Mass., *Grev.*, xix, 1890, p. 45.—*Polysaccum album* Cke. et Mass., *Grev.*, xx, 1891, p. 36.—*P. Pisocarpium* var. *novo-zelandica* P. Henn., *Engl. Jahrb.*, xviii, 1894, p. 37.—*Pisolithus tinctorius* (Mont.) Fisch., *Nat. Pflanzenfam.*, i, 1900, p. 338.—*P. australis* (Lev.) Fisch., *l.c.*—*P. marmoratus* (Berk.) Fisch., *l.c.*—*Polysaccum pusillum* Pat. et Har., *Jour. de Bot.*, xvii, 1903, p. 13.—*P. umbrinum* (Cke. et Mass.) Lloyd, *Lyc. Aus.*, 1905, p. 13.—*Pisolithus Kisslingi* Fisch., *Mitt. Nat. Ges. Bern.*, x, 1906, p. 10.

Plant variable in size and shape, from 3 to 18 cm. tall, to 10 cm. diameter, with or without a stout rooting base. Peridium a single layer, at first smooth, shining and pallid white or ochraceous, becoming brown or black, finally breaking away irregularly from the apex. Gleba divided into polygonal or lenticular chambers, which are larger above and peripherally, unequal in size and shape, disseminations carbonous, firm but brittle; chambers occupied with the pulverulent spore mass, ranging in colour from ochraceous to umber-brown, sometimes tinted purple. Spores globose, 7-12  $\mu$  (commonly 7-9  $\mu$ ) diameter; epispore thin, 0.5  $\mu$ , ferruginous, covered with densely packed spines which may attain a length of 1.5  $\mu$ .

*Type Locality*.—Europe.

*Distribution*.—Europe; North America; Africa; East Indies; Australia; New Zealand.

Queensland: (Cooke, *Hdbk. Aus. Fungi*, 1892, p. 243, as *Scleroderma umbrina*, *Polysaccum Pisocarpium*, *P. australe* Lev. and *P. album*). Moreton Bay, 6/12\*.—New South Wales: Kurrajong Mt., 8/12\*; Northbridge, Sydney, 4/16\*; Narrabri, 6/19\*.—Victoria: (Cooke, *Hdbk.*, 1892, p. 244, as *P. crassipes* and *P. album*); Ararat, E. J. Semmens\*.—South Australia: Overland Corner, 12/13\*; Mt. Lofty, 7/14\*, 6/17\*, 7/24\*; Belair, 6/20\*; Eagle-on-Hill, 4/21\*; Kuitpo, 5/21\*; Beltana, 8/21\*; Fullarton, Adelaide, 5/21\*, 1924\*, 4/25\*; Tunkalilla\*; Lake Wangany,

\* An asterisk denotes that the collection is in the herbarium of Dr. J. B. Cleland, Adelaide; and where no collector is mentioned, signifies that the collection was made by Dr. Cleland himself.

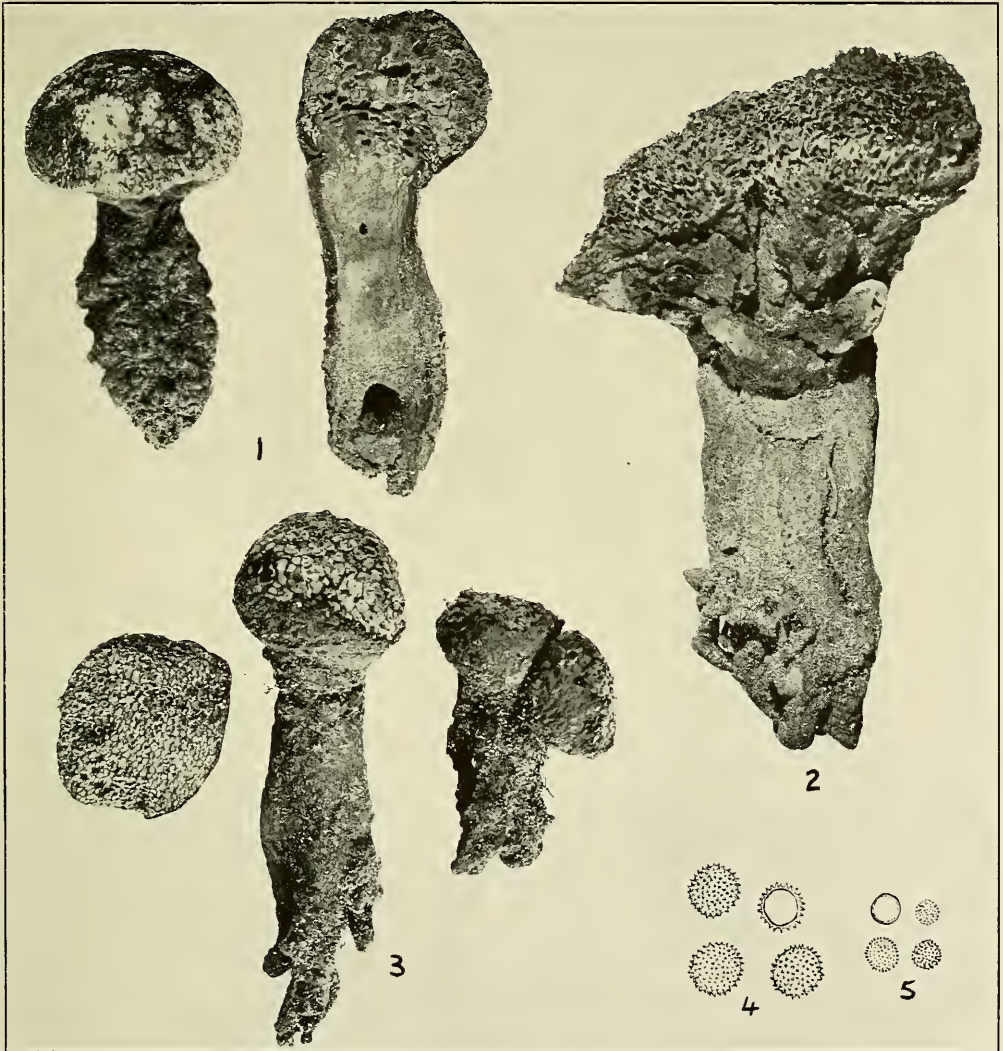
5/23\*; Pearson Island, 1/23\*.—Western Australia: Narrogin, 8/26\*; South Perth, 3/26, W. M. Carne.—Tasmania: (Lev., *l.c.*, as *P. australe*); no locality, L. Rodway.—New Zealand: Auckland, Whakarewarewa, 2/27, J. B. Cleland, G.H.C.; Geysers Valley, Wairekei, 8/30, 2/31, G.H.C.

This species is abundant in Australia, and is the only one found elsewhere (excluding the doubtful *P. Boudieri*). In New Zealand it is confined to the thermal regions of the North Island. The species is extremely variable as to size and shape, size of the cavities and colour of the gleba, and nature of the exterior of the peridium. All these variations appear to have been named at one time or another, but in the numerous collections examined, I find it is not possible to separate any one owing to the numerous intermediate forms which occur. Hollos (*Gast. Ungarns*, 1904, p. 133) has shown that the eight species named by Fries are all forms of this one. The prevalent form is pyriform in shape, and possesses a firm, black, well-developed rooting base. The peridium is exteriorly typically dark (though white or pallid ochraceous when immature) and smooth, but rugulose forms occur, especially in specimens in which the peridium is thin. *Polysaccum album* was based on a form with this pallid coloured peridium. When these white immature plants are bruised, pigmentation occurs, and if this is more or less arranged in the form of areolations, the plant assumes the appearance of the plant named *Polysaccum marmoratum*. The stem-like base is typically well developed, but is sometimes scanty or wanting (even in individuals of collections possessing strongly developed bases) and then becomes identical with the form named *Polysaccum tuberosum*. Those forms with strongly developed bases were named *P. crassipes*. The gleba in young plants is usually ochraceous, but as the plant ages it changes to ferruginous, and finally to umber-brown. *Scleroderma umbrina* was based on this last condition. The spores are commonly 7–9  $\mu$  in diameter; but forms with spores to 12  $\mu$  are quite common. The epispore is covered with closely compacted spines which may attain a length of 1.5  $\mu$ . Certain species have been recorded as possessing smooth spores, which is probably an error, for smooth spores are not known to occur with certainty in the genus, or indeed in the family.

This species was for many years known as *Polysaccum crassipes* (disregarding the numerous synonyms proposed by Fries) or *P. Pisocarpium*. But Schroeter (*Krypt. Fl. Schles.*, 1889, p. 704) and Hollos (*Gast. Ungarns*, 1904, p. 133) have shown that it possessed a prior name in *Pisolithus arenarius*. Then Lloyd (*Lyc. Aus.*, 1905, p. 13), accepting the synonymy given by Hollos (in which *Scleroderma tinctorium* Pers. was listed), pointed out that the specific name could quite well be that used by Persoon (which was based on the fact that the plant contained a yellow pigment used by the peasants of Europe as a dye), apparently overlooking the fact that it had been used by Montagne for a plant from the Canary Islands (*Polysaccum tinctorium* Mont.) or by Fischer in the combination *Pisolithus tinctorius* (Mont.) Fisch. Coker and Couch accordingly listed the species as *Pisolithus tinctorius* (Pers.) Coker and Couch, which is in keeping with the Rules of Botanical Nomenclature. The plant may have a prior name, since Persoon on a previous page of his *Synopsis*, described as *Scleroderma herculeanum* a plant which was cited by Fries doubtfully as *Polysaccum herculeum*.

## 2. PISOLITHUS MICROCARPUS (Cooke and Masee), n. comb.

*Polysaccum microcarpum* Cke. et Mass., *Grev.*, xvi, 1887, p. 28.—*P. australe* Cke. et Mass., *Grev.*, xvi, 1887, p. 29; non Lev. 1848.—*P. confusum* Cke. et Mass., *Grev.*, xvi, 1888, p. 76.



*Pisolithus* spp.